Most articles agree that there may be an embryological component to the development of aneurysms. Reported cases of inferior vena cava (IVC) aneurysms are extremely rare, with as few as 54 reported cases overall. IVC aneurysms are rare complications with fewer than 60 documented cases in the literature.

Intravenous ANEURYSM with Associated Bilateral Duplicated Renal Arteries: Case Study and Literature Review

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Abstract

IVC aneurysms are rare complications with fewer than 60 documented cases since the 1950s. Though complete etiology of their formation is as yet unclear, most sources agree that there is an embryological component involved in the development of caval aneurysms. These components carry with them multiple other structural and organogenic defects. There have been however, scattered reports of non-hereditary mechanisms of IVC aneurysm formation, such as trauma and longstanding systemic venous hypertension. The present case is of a 57-year-old female with a history of hypercholesterolemia, who presented to the outpatient clinic complaining of three days of diffuse abdominal pain. Incidental findings of an abdominal CT showed a distal Type IV fusiform IVC aneurysm, measuring 35 x 25 x 54 mm, with comorbid bilateral aneurysmal dilation of the iliac veins. Additionally, elucidated from the CT of the abdomen was that the aneurysm was bilateral dual renal arterial supply, not ed arteries. Due to the absence of known etiologic factors or processes, such as trauma or inflammatory, as well as the presentation of the aneurysm with bilateral dual renal arteries, this patient’s IVC aneurysm is supposed to be embryological in origin. The patient is currently undergoing additional studies to further investigate potential mechanisms and complications of her condition. Conservative or surgical treatment will then be determined.

Introduction

Reported cases of inferior vena cava (IVC) aneurysms are extremely rare, with as few as 54 reported cases over the last 63 years (8). The first reported case of caval system aneurysm was in 1950, by Dr. Osler Abbott, a 27-year-old asymptomatic male college student with an aneurysm of the superior vena cava (1).

Most articles agree that there may be an embryological component to the development of aneurysms in the caval system. Due to this embryological origin, there have been multiple associated defects reported in literature, including Tetalogy of Fallot, urogenital agenesis, membranous IVC obstruction, retroperitoneal ganglioneuroma, and left sided IVC (2). Other non-hereditary mechanisms of IVC aneurysms described in cases include trauma, inflammatory processes, and longstanding systemic venous hypertension (4, 7).

Gradman and Steinberg outlined the most widely used system of classifying and grading IVC aneurysms (5, 8). Their classification is based primarily on the anatomical location of the lesion with four types: type I aneurysms involve the suprarenal IVC without venous obstruction; type II aneurysms are associated with supra- or infrarenal caval interruption; type III aneurysms are located in the infrarenal IVC with no associated congenital anomalies; and lastly type IV aneurysms involve the iliac veins and are associated with a left-sided IVC (3). In addition to location, the aneurysm may be described as saccular or fusiform, with the majority of cases being saccular (3).

Montero-Baker, Branco, Lebon, Labrapoules, Echevarria, Mills have performed perhaps the largest review of literature to date and have found that the average age in which IVC aneurysm occurs across all types is 27.1 years of age (range of 5-89 years). Nearly one third of patients with an IVC aneurysm present with thrombus formation in the lesion along with other symptoms of venous HTN such as lower extremity edema, though many cases are asymptomatic (4). There have been some cases involving more severe presenting complications such as pulmonary embolism, paradoxical cerebral embolism, and massive venous bleeding (5).

Duplicated vasculature of the renal system is a condition in which the kidneys are associated with more than one arterial supply or venous drainage. Many cases of duplicated arterial supply of the renal system have been reported with as high as 21% of kidney donors having at least dual unilateral renal arteries and 10% receiving dual bilateral arterial supply (2, 5). Duplicated vasculature of the renal system, both venous and arterial, originates from embryological development as the kidneys ascend in utero.

Case Report

A 57-year-old female, with past medical history notable for hypercholesterolemia, presented to the outpatient clinic with a three-day history of diffuse abdominal pain. Pertinent physical exam findings included a right carotid bruit, absent posterior tibial pulses bilaterally, decreased dorsalis pedis pulses bilaterally, and claudication. The remaining physical exam was unremarkable. Preliminary vascular ultrasound showed no evidence of high-grade arterial stenosis, DVT, or thrombosis in the lower extremities.

Abdominal CTA with contrast was performed resulting in the incidental finding of a distal fusiform IVC aneurysm, measuring 35mm anteroposteriorly x 25mm transversely x 54mm cranio-caudally. Duplicated arterial supply to the kidneys bilaterally was also found. In addition, there was an atherosclerotic distal infrarenal abdominal aorta measuring 1.9cm x 2.1cm, and an aneurysmal dilatation of the common iliac veins bilaterally.

Discussion

An IVC aneurysm is truly a rare finding, which may pose additional risks to the patient depending on staging. Pending classification, patients may be treated conservatively or surgically. This case represents a 57-year-old female who after clinical workup for diffuse abdominal pain was found to have a fusiform infrarenal IVC aneurysm extending into bilateral common iliac veins (Figure 1). Additionally, she was found to have bilaterally duplicated renal arteries, which have been associated with IVC aneurysms (Figure 2). This case was classified as a Type IV IVC aneurysm due to distal involvement of the common iliac veins. The finding of an IVC aneurysm in this patient may have been the result of an embryological process as her medical history does not include a known etiologic factor, e.g., trauma, inflammatory process, or longstanding increased venous HTN. Adding to the possible embryologic nature is the presence of bilaterally duplicated renal arteries. In cases with multiple arterial supplies it is important clinically to note that these are end-arteries; therefore, if an accessory artery is compromised by surgical, traumatic, or pathologic injury, the area supplied is likely to become ischemic (2).

The present case represents an additional rarity to other cases of IVC aneurysms reported because the patient is 30 years older than the average age at finding, and the aneurysm is fusiform with common iliac vein involvement. In the literature review performed by Montero-Baker et al., clinical analysis of cases using Gradman and Steinberg’s classification concluded that asymptomatic Type I aneurysms could be treated conservatively with anticoagulant/thrombolytic therapy and an IVC filter, while most symptomatic Type I-IV aneurysms treated with surgery had increased mortality (8). Although endovascular adjunctive therapies for aneurysms, including transcatheter aimed at decreasing blood viscosity and suggestions for improving nutrition, have been historically identified and practiced, there currently are no accepted endovascular treatments for an inferior vena cava aneurysm, likely due to the very low volume of cases reported (10). Based on the stage and symptoms of the patient, treatment is recommended to both stabilize the aneurysm and prevent a possible complication of thrombosis. Discussions about whether to treat this patient conservatively or surgically are currently underway.

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References

3. Sarkhati S, Singh G, Wolosker N, Yazbek G, Nakagawa WT, Lopes A. Idiopathic aneurysm of inferior vena cava associated with retroperitoneal ganglioneuroma, and left sided IVC (8, 9). Other non-hereditary mechanisms of IVC aneurysms described in cases include trauma, inflammatory processes, and longstanding systemic venous hypertension (4, 7).


8. Osler Abbott, a 27-year-old asymptomatic male college student with an aneurysm of the superior vena cava (1). In the literature, there have been multiple associated defects reported in literature, including Tetalogy of Fallot, urogenital agenesis, membranous IVC obstruction, retroperitoneal ganglioneuroma, and left sided IVC (2). Other non-hereditary mechanisms of IVC aneurysms described in cases include trauma, inflammatory processes, and longstanding systemic venous hypertension (4, 7).

